

# The gene and its place

An interview with Steven Rose, neurobiologist and director of the Brain and Behaviour Research Group at the Open University, UK

**EMBO reports (ER):** You have been a long-standing critic of the way genetic research is used, particularly as a tool of social control. What are your worries in this regard?

**Steven Rose (SR):** I think that we see the increasing use not just of genetics, but also neurogenetics, to propose biochemical or genetic solutions to what I would define as social problems. If you take the current classifications of psychiatric disease in the American Diagnostic and Statistical Manual (DSM), you see things called conduct disorder, oppositional defiance disorder, attention deficit hyperactivity disorder. They're turning a problem of a person's relationship with others or society at large into a medical one. There are children who are disruptive at school or are a problem for their parents, and on the basis of the school report, the parents' report or the psychiatric report, you decide that these children have a disease, and you call the disease Attention Deficit Hyperactivity Disorder and you then provide a drug, Ritalin, in order to "control" the child. Now it's not that Ritalin is not effective in sedating an over-active kid, it certainly is, but it's turning a complex social relationship into a problem inside the brain of a child and therefore inside the genes of a child. That disturbs me and I can see that it is symptomatic of a problem that is becoming more and more prevalent with the increase in genetic knowledge, with its attempts to find individual solutions to problems rather than to seek public health solutions.

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**ER:** With that in mind, do you think it's time for an Asilomar meeting on neuroscience?

**SR:** I'm not sure if Asilomar is the right format. We need to develop proactive methods of discussing potential technological advances before they become an unstoppable technology. At the moment, the directions are driven partly by the technology, partly by the interests of the pharmaceutical companies and partly because of this huge new interest in biodefence. You have to engage civil society at a much earlier stage than we're able to do at the moment and in Europe we are much better placed to do this than in the United States.

**ER:** Why?

**SR:** Because we have a tradition of the involvement of civil society. We don't have a situation as in the United States where the federal government can legislate but private companies can do almost what they like. The sense of society as opposed to individual consumer rights is still greater in Europe, especially in continental Europe.

**ER:** What would you like to come out of such a debate on neuroscience? Would you like to see a certain form of neuroethics emerge?

**SR:** There are a number of issues, which the development of neurosciences, genetics and information technology are bringing together and I think they need to be discussed in a format which enables us to make predictions about the way things might be going and try to influence their directions. I think that it has not just to be in the form of Asilomar, a group of concerned neuroscientists, or in that case

molecular geneticists, getting together. We need to develop the sorts of processes which some of the Scandinavian countries have pioneered, of citizens' consultative fora, citizens' juries and so on. In Britain, there's just been that in the context of GM, and the overwhelming popular response was that we don't want it, thank you very much indeed. The response to this was a letter written by a hundred-plus "scientists" saying the public has been misled. They've called foul because it gave them the answer they didn't want. Now the problem, of course, is that many geneticists and molecular biologists have interests, they have shares, they have directorships, they are involved in companies, they have patents and so on. One of the things that's happened is that the whole nature of the way that science, particularly biology, is done now is an irreversible shift towards Big Science. We've become a science with huge interests. The idea of going back to the disinterested world of small science is a pipe dream. Therefore we've got to find ways in which the interests themselves come onto the table along with people's viewpoints so that we go for greater transparency and recognize that the scientist is just one player in a much more complex world.

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**ER:** Why is there such a tendency to use genetic explanations for social problems?



**SR:** There are several different levels at which you can answer that. On the one hand, if we look at the area which interests me, of behaviour and the terrain of psychology and psychiatry, these are very soft sciences by comparison with the other biological sciences. They can't predict, they can't provide explanations and their definitions are obscure, and so there's always been a tendency for them to latch on to what is the most powerful technology or language of the time. Now because gene talk and gene technology are so powerful, there's an attempt on the part of behavioural geneticists and evolutionary biologists to latch on to that power. Another answer is that neurogenetics is intimately tied up with the goals of the pharmaceutical companies, and therefore they are driving the science forward in particular directions. You can see that in the ways in which new drugs are marketed. As I've pointed out, new disease entities are being created in the area of psychiatry in order to match the things that the drugs do.

And then even beyond that there's a much deeper problem in the biological sciences in general. Biology is a latecomer to the hard sciences in the history of the development of Western science—physics and chemistry came first. The ideal of science as portrayed by philosophers was physics—hard science, where you had theories, you had facts, you did experiments, made predictions, and you could fit everything together with rules. Many biologists want their science to be like that and yet it isn't. Biology is messy, it's contingent, it's highly complicated and therefore much more interesting, of course, than the narrow frameworks of physics and chemistry. But the power of molecular talk is very seductive because it seems somehow much closer to the hard sciences. What I think has happened over the course of the past 50 years is that organisms have almost vanished from the discourse of biology. An organism has become a tool with which you understand or probe the gene. I've even heard people talking about behaviour as a tool with which

to probe genes. What I would like to do is to put the organism rather than the gene back at the centre of the discussion, the organism in its rich interactions with the environment. What becomes important then is the whole developmental life cycle, in which genes are a part. In that sense I want to put genes in their place within biology and within the discourse of power.

**ER:** So you don't believe in systems biology, the attempt to understand an organism by analysing its genes using huge-scale computation?

**SR:** I understand the problem that the geneticists have. The discourse of genes was always the discourse of single genes, of Mendelian genes: we will have the genome, we will have the code, we will have the book of life. Now we've got 20,000 or 30,000 genes, and people say we need proteomics to map the distribution of proteins within the body. It may be that proteomics is simply a smart way of talking about

biochemistry—and I'm in my heart and soul a biochemist—but it misses the crucial feature which all biochemists understand, and that is the dynamics. The definition of 'life' as the readout of the genome is thus in contrast to what we were being offered by the great biochemist Frederick Gowland Hopkins' definition of life as a 'dynamic equilibrium in a polyphasic system'. It is dynamics that we have to get back into the system. What Stuart Kaufman and other people have been talking about in terms of the stability of a system being located in the complexity of the system, not in its individual components. We do not need a detailed understanding of particular transcription factors, and the pathways of ERKs and ELFs and all the rest that go on before you even get gene activation. I think what we need to understand are the functional changes that are taking place within a system.

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**ER:** Why are simplistic claims still being made about genes being linked to behaviour? Why are they rarely corrected even when proved wrong?

**SR:** I think there are different, but related reasons. Sometimes you find the claims corrected but they're corrected very quietly, and no one's interested in negative results. Look at the number of times the schizophrenia gene has been discovered. You do see those simplistic claims being made, particularly in the context of behaviour, but generally molecular biologists don't understand behaviour. They don't understand that there is no one such thing as aggression, violence, or even memory. Another problem is this real philosophical and conceptual problem about bridging levels. We're sitting here at exactly the same time as 30,000 neuroscientists are meeting in New Orleans (LA, USA). You will see at least 30,000 posters being presented ranging from the molecular to the imaging to the information technology and modelling systems and they do not speak to one another. They live in different universes of discourse though they still think they're studying the brain.



We can't bridge these different languages, and to go from the gene to the behaviour is bridging even more gaps of complexity. But gene talk is powerful talk. You can talk about monoamine oxidase genes [influencing aggression] and you'll find that in US courts of law, people will try to have a gene test to show they weren't responsible [for a crime], it was their gene that was responsible. My son is a criminal defence lawyer and I asked him if he would ever use a plea of this sort and he said "Well, yes, if I thought it would work."

But there's a much broader issue. If you go back to the 1960s, there was an enormous optimism that it was possible to create a more beautiful society through social and political revolution. People have lost that degree of hope in changing the world for the better. The best we see is a set of problems that we need to address to try to prevent things from getting worse. Faced with that world, you look for solutions at the level of the individual, rather than the level of society. So, you don't get State eugenics, as in Nazi Germany or Sweden until quite recently, but what we are being offered is the freedom of choice, what Hilary Rose calls consumer eugenics. We've moved into a world in which individual choice is what matters. If I can buy the best school for my kid, if I can choose the sex of my kid, if I can enhance its potential in some way, why not? So you create this image of individual choice, and gene talk is extremely powerful in that context.

**ER:** How do you feel then about individuals using 'smart drugs' to modify their brain chemistry?

**SR:** So far I think that technically speaking most of the substances that are claimed to be smart drugs don't really work. On the other hand, my own research has now produced a novel potential therapy for Alzheimer's disease, a peptide, which does seem to act as a cognitive enhancer, if it's translatable from animal experiments into the human condition. But now there is a new disorder in the DSM, age-associated memory impairment or 'cognitive impairment', as they call it now. The argument is that everyone of my age and even 15 years younger than me is suffering from an irreversible decline in cognition and memory and that therefore we ought to have drugs to prevent or reverse the process. Now it's perfectly true that on a number of diagnostic tests, by the time you're my age it takes more trials to reach an association, even a reflex association, than it does at a younger age. On the other hand, the ultimate performance is going to be no different if you just give me enough time. I think it is characteristic of our society that being slow, being wiser, being more thoughtful is perhaps not an advantage. So the drugs are going to be there, and the drugs are going to be used like people used amphetamines to stay awake and revise for their exams. We need to get to grips with the entire problem of mood and performance changing agents, whether it's steroids for athletes or whether it's drugs that help you to stay up and dance all night or whatever. Society's got itself into a total mess and confusion about it. Some things are illegal, some things are legal but prescribed, some things are legal and you can buy them across the counter, some things are illegal but you can get them on the Internet, and some things are legal under some circumstances and not legal under other circumstances. We've got to understand and find ways of incorporating these new mood changers into our society, ways which don't produce the illegal drug culture which is driving criminality and gun use across Europe.

**ER:** You often write for the British press and appear on radio programmes to discuss these

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issues. Would you like to see some of your colleagues be as forthcoming in these debates?

**SR:** Well yes, but I think one's got to see that back in the 1960s, when Hilary and I and other people were involved in Britain in the 'Society for Social Responsibility in Science', or people like Jon Beckwith were involved in 'Science for the People' in the USA, the issues were about science in general. We thought about what scientists ought to do, as if there was some universal person called 'a scientist'. Now there isn't a scientific community, it's deeply fragmented. Most people with scientific training work in industry, some work in universities or research institutes. I think that scientists, as any expert in civil society, have a particular responsibility to make that expertise democratically accountable and available. I strongly believe that I ought to be able to describe what I'm doing to a class of six-year olds in a way that they understand, but I don't think I've got more or less ethical expertise than any other member of civil society. What's more, I don't have the expertise to talk about developments in areas where I don't have special scientific knowledge. So we are all lay people in most aspects of our lives. Insofar as we have expertise as scientists, we have a responsibility to say, as I'm trying to do in the field of neurogenetics and neuroethics, that these are things that are happening, these are implications that I see coming, and I'd like to discuss them in as broad a forum as possible and involve as many people as possible to produce democratic decisions about the directions in which things could go.

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**ER:** Do the media have a special responsibility here in presenting science to the public, or is it the scientists' responsibility?

**SR:** I think both things matter. One of the consequences of living in this competitive world is you get what I would call 'megaphone' science. It's tremendously important to have your paper published in a journal with the highest possible impact factor and it seems to be important for the journals and for your university to issue a press release about the exciting things that you've discovered.

If you look at a lot of the media headlines, they are direct translations of the press releases put out by *Nature* or *Science* or the university; the claims of the finding of a 'gay gene' is a very good example of that. The origin of megaphone science is with the scientists themselves, puffing up the work that they are doing. And of course the media is also responsible because they like simple stories, they like to say "a gene or a drug for Alzheimer's has been discovered" and "there'll be a drug you can pop next year that will prevent granny getting Alzheimer's." But they also like to say "scientists claim that MMR produces autism," which has been very problematic in Britain. So the press picks up completely maverick—and I would say irresponsible—statements by people who have some scientific credentials. But you should not try and shoot the messenger, the problem is the message.

**ER:** You have also been active in debates outside neurobiology, in particular in calling for a moratorium on Europe's scientific cooperation with Israel. Why did you feel this was necessary?

**SR:** I have a special history, being brought up as a Jew in a Zionist household, so I had quite a lot of emotional links with Israel. In the 1967 war, I actually volunteered to fight on the Israeli side, they didn't call me but I was part of a queue outside the Israeli embassy. It took me a long time before I realized the actual nature of Israeli society, which had expropriated the people who lived on that land before them to create an essentially apartheid society. My partner and I also had a long history of being engaged in anti-racist activities of the sort that you would expect from someone who's a 1960s radical. In light of the increasingly oppressive actions of the Israeli government two years ago, we were wondering what civil society could do about this. Somehow the European research systems regard Israel as part of Europe. And we thought that this is an extraordinary anomaly. Here is a country which is in breach of the European Convention on Human Rights and in breach of more than 200 United Nations resolutions, so what can we do? One thing that you can do is to point out this anomaly and, just as there was a civil society boycott of apartheid South Africa, we could ask for a moratorium on European research collaboration with Israel under the EU Framework agreements, and that's what we wrote. It's a very simple letter, circulated to a few

colleagues and friends, and everyone wanted to sign it. So after a week we sent it as a letter to *The Guardian* [UK newspaper] with, I think, something like 120 signatures on it. The French set up a website with a different version of the call, which then became a call for a boycott, and suddenly out of this simple letter was a major polarization of people. We expected that some people wouldn't agree with it, but there was huge pressure on everyone who had signed the original petition.

**"The idea that you can divorce science from the social context in which it's done is completely naive."**

**ER:** Were you surprised about this?

**SR:** I was surprised at the intensity of it, that was quite educational. I didn't expect that the EU would fold over and Philippe Busquin would say "you're right" and "we're going to cancel the arrangements". But what I also didn't expect was the intensity of the personal hate mail directed at every individual who'd signed it, or the pressure to lose public positions or to resign from editorial boards. I'm used to dealing with political arguments, but that sort of passionate hate says something about the nature and complexity of the problem in trying to make Israelis understand that the only satisfactory solution for Israel is to accept the legitimacy of the Palestinian demand for statehood and the return of the refugees Israel drove away from their homes and land.

**ER:** Some of your critics maintain that the basis of science is freedom, and science should not be a political tool.

**SR:** It's a ridiculous argument. If you look at the EU Framework Programme, it is driven by economic and political criteria. This is not free science, this is science that is directed towards particular goals and if we call for a moratorium on scientific collaboration with Israel, we are calling for a moratorium on something which is in itself a political engagement. The idea that you can divorce science from the social context in which it's done is completely naive.

**ER:** Professor Rose, thank you for the interview.

*The interview was conducted by Holger Breithaupt and Caroline Hadley.*

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